

ATARASHI

Serial No. 10/822,698

Response to Office Action dated July 27, 2006

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AMENDMENTS TO CLAIMS:

The following Listing of Claims replaces all prior versions, and listings, of claims in the subject patent application.

Listing of Claims:

Claim 1 (Currently Amended): A low-noise block down-converter receiving M ($M \geq 2$) types of polarization signals from each of N ($N \geq 2$) satellites, comprising:

N frequency converting circuits each corresponding to one satellite and converting frequency bands of M types of polarization signals received from the corresponding satellite into M intermediate frequency bands that do not overlap one another;

N first signal couplers each corresponding to one satellite and performing frequency-multiplexing of said M types of polarization signals from the corresponding satellite having their frequency bands converted, to generate a first combined signal; and

a signal rearranging circuit selecting any M first combined signals from N of said first combined signals allowing duplicate selection, taking out any one polarization signal from each of the selected first combined signals, and performing frequency-multiplexing of the taken out M polarization signals to generate at least one [[a]] second combined signal.

Claim 2 (Currently Amended): The low-noise block down-converter according to claim 1, wherein

said signal rearranging circuit includes

a switching circuit including ~~having~~ N input terminals and M output terminals, receiving N of said first combined signals and outputting any of said received first combined signals to each of M output terminals,

ATARASHI

Serial No. 10/822,698

Response to Office Action dated July 27, 2006

M frequency controlling circuits each receiving said first combined signal output from a corresponding one of said output terminals and setting signal components included in a corresponding band of said received first combined signal to be any polarization signals included in said received first combined signal, and

M filters each passing signal components of a corresponding band of an output signal of a corresponding one of said frequency controlling circuits, and

a second signal coupler performing frequency-multiplexing of the output signals of said M filters, to generate a second combined signal.

Claim 3 (Currently Amended): The low-noise block down-converter according to claim 2, wherein

said frequency controlling circuits each include a switch that can be switched arbitrarily arbitrary, and a mixer,

said switch receives said first combined signal output from a corresponding one of said output terminals, and outputs said first combined signal to said filter without any change in a first state, and outputs said first combined signal to said mixer in a second state, and

said mixer mixes said first combined signal and a signal of a prescribed frequency, and outputs the mixed signal to said filter.

Claim 4 (Currently Amended): The low-noise block down-converter according to claim 1 [[2]], wherein

said low-noise block down-converter includes K ($K \geq 2$) of said signal rearranging circuits;

each signal rearranging circuit includes

a switching circuit including N input terminals and 2 x M output terminals, receiving N of said first combined signals and outputting any of said received first combined signals to each of 2 x M output terminals.

ATARASHI

Serial No. 10/822,698

Response to Office Action dated July 27, 2006

2 x M frequency controlling circuits each receiving said first combined signal output from a corresponding one of said output terminals and setting signal components included in a corresponding band of said received first combined signal to be any polarization signals included in said received first combined signal,

2 x M filters each passing signal components of a corresponding band of an output signal of a corresponding one of said frequency control circuits, and

two second signal couplers each performing frequency-multiplexing of the output signals of M filters of said 2 x M filters, to generate a second combined signal

~~said switching circuit of said signal rearranging circuit further includes M output terminals, and outputs any of said received first combined signals to each of M output terminals;~~

~~said signal rearranging circuit further including~~

~~M frequency controlling circuits corresponding to signals output from said M output terminals, M filters corresponding to outputs of said M frequency controlling circuits, and one signal coupler corresponding to outputs of said M filters, and generating two second combined signals, and~~

~~said low noise block down converter includes K ($K \geq 2$) of said signal rearranging circuits.~~

Claim 5 (Original): A low-noise block down-converter, comprising:

a switching circuit including $N \times M$ ($N \geq 2$, $M \geq 2$) input terminals and M output terminals, receiving M types of polarization signals from each of N satellites, and outputting any of said received polarization signals to each of M output terminals;

a frequency converting circuit converting frequency bands of M polarization signals output from said switching circuit into M intermediate frequency bands that do not overlap with one another; and

a signal coupler performing frequency-multiplexing of said M polarization signals having their frequency bands converted, to generate a combined signal.

ATARASHI

Serial No. 10/822,698

Response to Office Action dated July 27, 2006

Claim 6 (Original): A low-noise block down-converter receiving M ($M \geq 2$) types of polarization signals from each of N ($N \geq 2$) satellites, comprising:

N frequency converting circuits each corresponding to one satellite and converting frequency bands of M types of polarization signals received from the corresponding one satellite into M intermediate frequency bands that do not overlap one another;

M switching circuits each corresponding to a type of said polarization signals, and receiving a corresponding one type of said polarization signals from N satellites having its frequency band converted, and outputting any of said received polarization signals; and

a signal coupler receiving said M polarization signals from said M switching circuits and performing frequency multiplexing of said M polarization signals to generate a combined signal.

Claim 7 (Original): A satellite broadcasting receiving apparatus receiving M ($M \geq 2$) types of polarization signals from each of N ($N \geq 2$) satellites, comprising:

a low-noise block down-converter including

N frequency converting circuits each corresponding to one satellite and converting frequency bands of M types of polarization signals received from the corresponding satellite into M intermediate frequency bands that do not overlap one another;

N signal couplers each corresponding to one satellite and performing frequency-multiplexing of said M types of polarization signals from the corresponding satellite having their frequency bands converted, to generate a first combined signal; and

a signal rearranging circuit selecting any M first combined signals from N of said first combined signals allowing duplicate selection, taking out any one polarization signal from each of the selected first combined signals, and performing frequency-multiplexing of the taken out M polarization signals to generate a second combined signal; and

ATARASHI

Serial No. 10/822,698

Response to Office Action dated July 27, 2006

a tuner receiving said second combined signal output from said low-noise block down-converter, and performing a tuning process and a decoding process based on said second combined signal.

Claim 8 (New): A satellite broadcasting receiving apparatus comprising a low-noise block down-converter according to claim 1.

Claim 9 (New): The low-noise block down-converter according to claim 5, further comprising another switching circuit downstream of the signal coupler.

Claim 10 (New): A satellite broadcasting receiving apparatus comprising a low-noise block down-converter according to claim 5.

Claim 11 (New): The low-noise block down-converter according to claim 6, further comprising another switching circuit downstream of the signal coupler.

Claim 12 (New): A satellite broadcasting receiving apparatus comprising a low-noise block down-converter according to claim 6.

Claim 13 (New): A low-noise block down-converter receiving M ($M \geq 2$) types of polarization signals from each of N ($N \geq 2$) satellites, comprising:

N frequency converting circuits each corresponding to one of the satellites and each converting frequency bands of M types of polarization signals received from the corresponding satellite into M non-overlapping intermediate frequency bands;

N first signal couplers each corresponding to one of the satellites and each frequency-multiplexing the M types of frequency-converted polarization signals from the corresponding satellite, to generate a respective first combined signal; and

ATARASHI

Serial No. 10/822,698

Response to Office Action dated July 27, 2006

a signal rearranging circuit selecting any M first combined signals from the N first combined signals, taking out any one polarization signal from each of the selected first combined signals, and frequency-multiplexing the taken out M polarization signals to generate at least one second combined signal,

wherein the signal rearranging circuit allows for duplicate selection of one or more of the N first combined signals.

Claim 14 (New): The low-noise block down-converter according to claim 13, wherein the signal rearranging circuit comprises:

a switching circuit including N input terminals and at least M output terminals, wherein each of the N input terminals receives a corresponding one of the N first combined signals and wherein any of the received first combined signals can be switched to any of the M output terminals;

M frequency controlling circuits each of which selectively frequency-controls a first combined signal from a corresponding one of the output terminals of the switching circuit;

M filters each filtering signals from a corresponding one of the frequency controlling circuits; and

a second signal coupler for frequency-multiplexing outputs of the M filters to generate a second combined signal.

Claim 15 (New): The low-noise block down-converter according to claim 14, wherein each frequency controlling circuit comprises a switch and a mixer and wherein the switch has a first state in which the first combined signal supplied thereto is output from the frequency controlling circuit unchanged and a second state in which the first combined signal supplied thereto is mixed with another signal by the mixer before being output from the frequency controlling circuit.

ATARASHI

Serial No. 10/822,698

Response to Office Action dated July 27, 2006

Claim 16 (New): The low-noise block down-converter according to claim 13, wherein said signal rearranging circuit comprises multiple signal rearranging circuit sections, each signal rearranging circuit section including:

a switching circuit including N input terminals and at least $2 \times M$ output terminals, wherein each of the N input terminals receives a corresponding one of the N first combined signals and wherein any of the received first combined signals can be switched to any of the $2 \times M$ output terminals;

$2 \times M$ frequency controlling circuits each of which selectively frequency-controls a first combined signal from a corresponding one of the output terminals of the switching circuit;

$2 \times M$ filters each filtering signals from a corresponding one of the frequency controlling circuits; and

M second signal couplers each frequency-multiplexing outputs of M filters to generate a respective second combined signal.

Claim 17 (New): The low-noise block down-converter according to claim 16, wherein each frequency controlling circuit comprises a switch and a mixer and wherein the switch has a first state in which the first combined signal supplied thereto is output from the frequency controlling circuit unchanged and a second state in which the first combined signal supplied thereto is mixed with another signal by the mixer before being output from the frequency controlling circuit.